

observed on 22 July, and first fledged about 5 August. This phenology is essentially identical to that of Tatoosh Island (J. Parrish, unpubl. data). In contrast, murres at Oregon colonies typically begin egg-laying in late April to early May, and fledge young by late June to early July (J. Parrish unpubl. data).

Table 11. Locations and maximum daily numbers of Common Murre adults, chicks and eggs at the Grenville Complex in the summers of 1997 and 1998.

Date	Location			
	Big Stack (adults, eggs, chicks)	Erin (adults, eggs, chicks)	Erin's Bride (adults, eggs, chicks)	Grenville Arch (adults, eggs, chicks)
10 July 1997	46, 2*, 0	--	--	--
14 July 1997	106, 0, 0	--	--	--
21 July 1997	103, 0, 0	--	--	--
22 July 1997	102, 0, 1	--	--	--
23 July 1997	105, 0, 2-4(?)	--	--	--
28 July 1997	71, 0, 9	--	--	--
1 August 1997	52, 1, 3	--	--	--
5 August 1997	90, 1, 1	--	--	--
7 August 1997	115, 1, 2	--	--	--
2 July 1998	91, 0, 0	19, 0, 0	24, 0, 0	35, 0, 0
8 July 1998	68, 0, 0	51, 0, 0	13, 0, 0	0, 0, 0
15 July 1998	47, 0, 0	10-15, 0, 0	0, 0, 0	40-50, 0, 0
21 July 1998	57, 0, 0	20, 0, 0	1, 0, 0	3, 0, 0
29 July 1998	40, 0, 0	29, 0, 0	3, 0, 0	24, 0, 0

* Two eggs initially observed about 1 July by Ken Warheit (WDFW) and subsequently on about 5 July by C. Thompson (WDFW).

Objective 3: Immigration of murres from Oregon.

Murres breed in huge numbers (approximately 700,000 total murres in Oregon, R. Lowe, USFWS, Pers. comm.) in Oregon compared to Washington where only a few thousand pairs breed. Thus, when murre mortality results from natural or anthropogenic events, it is a goal of management to be able to estimate as best as possible the percentage of mortality to Oregon

versus Washington murre. Documenting the magnitude and geographic extent of summer and fall immigration of post-reproductive adult murre and their chicks from Oregon breeding colonies northward into Washington is a first step toward this goal.

Murre fledge with their fathers from breeding colonies in Oregon in late June or early July, on average, and disperse as far north as Cape Flattery and the outer Strait of Juan de Fuca by late July to early August (Thompson 1997a). In contrast, young murre do not fledge from Tatoosh Island, the only colony at which murre are known to breed annually in Washington, until early August or later. As a result, the distribution and abundance pattern of murre in Washington changes over the course of the summer. Murre chicks are accompanied by their fathers for at least a month after fledging. Thus, we speculated that the most definitive and least costly way to monitor the immigration of post-reproductive Oregon murre into Washington is by documenting the distribution and abundance of dad-chick murre pairs along the outer coast of Washington from late June through late August or early September.

We attempted to do this in summer 1996; however, extremely low reproductive success of Oregon murre resulted in very low rates of dad-chick pair immigration into Washington in July and August (Thompson 1997a). Thus, in the summers of 1997 and 1998, we surveyed the outer Washington coast for dad-chick pairs every other week from early June through early to mid-September (Tables 2, 4, 12).

Table 12. Observations of dad-chick pairs of murre along the outer Washington coast and Strait of Juan de Fuca in summer 1997.

Date	General Geographic Location	Transect Location	Distance from shore	Transect Length (km)	Number of dad/chick pairs	Density per 10 linear kilometer
06 AUG	North Coast	Lapush to Neah Bay	offshore*	80.25	4	0.25
06 AUG	North Coast	Neah Bay to Lapush	nearshore**	80.11	5	0.31
13 AUG	North Coast	Umatilla to Lapush	offshore	133.56	7	0.26
13 AUG	North Coast	Westport to Lapush	nearshore	161.06	14	0.43
14 AUG	North Coast	Lapush to Westport	offshore	124.66	21	0.84
05 AUG	Strait	Port Angeles- Neah Bay	nearshore	102.41	0	0.00
07 AUG	Strait	Neah Bay to Port Angeles	offshore	97.95	1	0.05
19 AUG	Strait	Port Angeles east 15 km	200 M	14.63	0	0.00
19 AUG	Strait	Port Angeles to Neah Bay	offshore	97.08	1	0.05
19 AUG	Strait	Seal Rock to Kydaka Point	500 M	15.52	0	0.00
19 AUG	Strait	Seal Rock to Kydaka Point	zig-zag	18.97	0	0.00
19 AUG	Strait	Seal Rock to Kydaka Point	800 M	14.67	0	0.00
20 AUG	Strait	Seal Rock to Kydaka Point	500 M	14.99	0	0.00
20 AUG	Strait	Seal Rock to Kydaka Point	zig-zag	20.69	1	0.24
20 AUG	Strait	Neah Bay to Port Angeles	nearshore	102.9	4	0.19
25 AUG	Strait	Seal Rock to Kydaka Point	200 M	14.88	2	0.67

25 AUG	Strait	Seal Rock to Kydaka Point	500 M	14.17	0	0.00
25 AUG	Strait	Seal Rock to Kydaka Point	200 M	14.99	0	0.00
25 AUG	Strait	Seal Rock to Kydaka Point	800 M	13.73	1	0.36
25 AUG	Strait	Seal Rock to Kydaka Point	800 M	13.9	1	0.36
25 AUG	Strait	Seal Rock to Kydaka Point	zig-zag	20.6	1	0.24
16 JUL	South Coast	Willapa Bay to Columbia River	nearshore	76.34	0	0.00
16 JUL	South Coast	Mouth of Willapa Bay		6.49	0	0.00
17 JUL	South Coast	Willapa Bay to Columbia River	nearshore	75.48	1	0.07
30 JULY	South Coast	Willapa Bay to Columbia River	nearshore	80.88	3	0.19
30 JULY	South Coast	Willapa Bay to Columbia River	offshore	81.09	7	0.43
31 JULY	South Coast	Willapa Bay to Columbia River	offshore	82.91	11	0.66
31 JULY	South Coast	Willapa Bay to Columbia River	nearshore	77.06	4	0.26
12 AUG	South Coast	Willapa Bay to Columbia River	nearshore	76.79	14	0.91
12 AUG	South Coast	Columbia River to Willapa Bay	offshore	77.03	19	1.23
12 AUG	South Coast	Mouth of Gray's Harbor		4.26	0	0.00
14 AUG	South Coast	Mouth of Gray's Harbor		8.15	1	0.61

* "nearshore" approximates 400 meters from shore, except in locations where hazards exist.

** "offshore" approximates 1200 meters from shore

No dad/chick pairs found during surveys of SOUTH COAST (south of Gray's Harbor) on 19-20 June and 02 July

No dad/chick pairs found during surveys of NORTH COAST (north of Gray's Harbor) on 11-12 June, 24-25 June, 9-10 July, and 15 July

No dad/chick pairs found during surveys of STRAITS on 22-25 July

Figures 17 and 18 (below) illustrate the density of dad-chick pairs of murre immigrating northward along the outer coast of Washington and eastward down the Strait of Juan de Fuca in the summers of 1997 and 1998. Based on data from other researchers who observed the breeding of murre at Oregon colonies in 1997 and 1998 (Roy Lowe, USFWS; J. Parrish, Univ. Of Washington), we know that murre achieved much greater reproductive success in 1998 than in 1997. Correspondingly, the mean density of dad-chick pairs in 1998 was more than ten times that of 1997. This suggests that this method of monitoring murre immigration is both sensitive and accurate, and may be used in future years to forecast the magnitude of murre immigration into the Strait of Juan de Fuca and Puget Sound during Tribal and non-tribal gill-net fisheries.

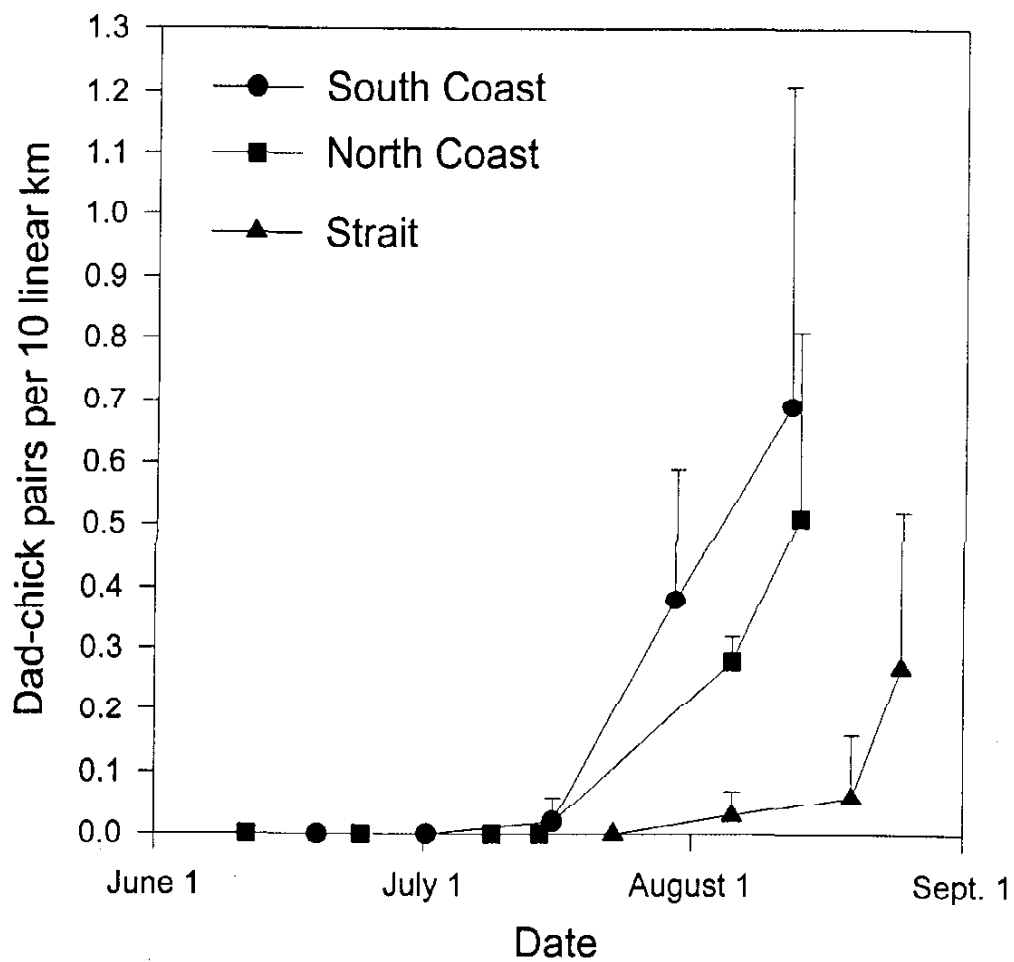


Figure 17. Density of dad-chick pairs of Common Murres along the outer coast and Strait of Juan de Fuca of Washington in the summer of 1997.

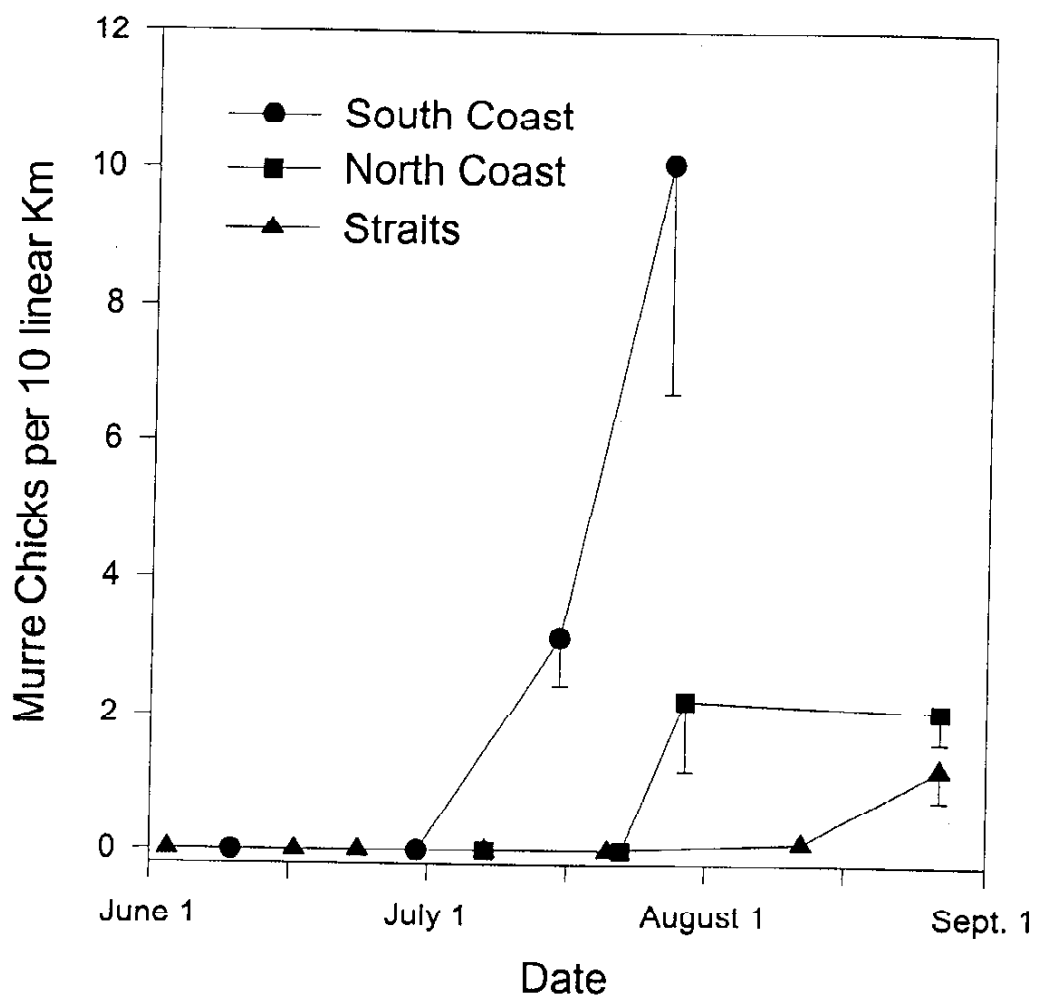


Figure 18. Density of dad-chick pairs of Common Murres along the outer coast and Strait of Juan de Fuca of Washington in the summer of 1998.

Literature Cited

- Buckland, S.T., D.R. Anderson, K.P. Burnham, and J.L. Laake. 1993. Distance sampling: Estimating abundance of biological populations. Chapman and Hall, London.
- Laake, J.L., S.T. Buckland, D.R. Anderson, and K.P. Burnham. 1996. Distance user's guide, Volume 2.2. Colorado Cooperative Fish and Wildlife Research Unit, Colorado State University, Fort Collins, CO.
- Hamer, T., and C.W. Thompson. 1997. Avoidance of boats by Marbled Murrelets during marine surveys. Final Report to U.S. Fish and Wildlife Service, North Pacific Coast Ecoregion, Olympia, WA. 17 pp.
- Speich, S.M., and T.R. Wahl. 1989. Catalog of Washington seabird colonies. U.S. Fish and Wildlife Service Biological Report 88(6). 510 pp.
- Thompson, C.W. 1997a. Distribution and abundance of Marbled Murrelets and Common Murres on the outer coast of Washington — Completion report to the *Tenyo Maru* Trustee's Council. Washington Dept. of Fish and Wildlife, Olympia, WA.
- Thompson, C.W. 1997b. Distribution and abundance of Marbled Murrelets on the outer coast of Washington, winter 1996-1997. Draft report to the Washington Department of Natural Resources.

**TENYO MARU TRUSTEE COMMITTEE
RESOLUTION 1997-06
ADOPTED July 2nd, 1997**

**THE TENYO MARU TRUSTEE COMMITTEE RESOLUTION
Authorizing At-sea distribution and abundance of Common Murres
and Marbled Murrelets in Year 1997**

The Tenyo Maru Natural Resource Trustees U.S. Department of the Interior, including the U.S. Fish and Wildlife Service (USFWS), the National Oceanic and Atmospheric Administration (NOAA) of the Department of Commerce, the State of Washington, and the Makah Indian Tribe, are preparing a Restoration Plan pursuant to a Consent Decree under United States et al. V. Maruha Corporation et al. (C94-1537, W.D. Wash., Dec.23,1994).

The Tenyo Maru Natural Resource Trustee Committee (Committee) determined that six pilot projects were necessary in order to provide time sensitive data needed to advance the goals of the restoration program prior to the preparation of the Final Restoration Plan. The criteria for those pilot projects were adopted by consensus of the Committee in Resolution 1995-3 in accordance with its Bylaws. Resolutions 1995-5, as adopted, selected the six pilot projects in conformance with that criteria.

The following project is a continuation of monitoring on the outer coast. Washington Department of Fish and Wildlife continues to progress toward developing an accurate set of methodologies for surveying at sea for Marbled Murrelets and Common Murres.

NOW THEREFORE, IT IS HEREBY RESOLVED THAT

The pilot project entitled "At-sea distribution and abundance of Common Murres and Marbled Murrelets" is hereby approved for year 1997. Attached is the proposal and cost information regarding the project. The Washington Department of Fish and Wildlife is authorized to incur costs not to exceed \$ 59,131.00.

By their signatures on the attached page, representatives of the Trustees hereby certify that this resolution was adopted in compliance with the decision-making procedures adopted by the Trustees, and that expenditure of the funds specified in the identified manner is consistent with the terms of the Consent Decree, the Memorandum of Agreement, and other applicable law and is required for the preparation of the Tenyo Maru Final Restoration Plan.


TENYO MARU TRUSTEE COUNCIL
RESOLUTION NUMBER 1997-06

Signature Page

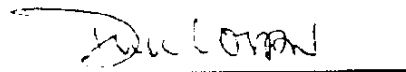
By unanimous consent the Tenyo Maru Natural Resource Trustee Council hereby adopts and approves the attached resolution authorizing funding not to exceed \$59,131.00 for the project titled "At-sea Distribution and Abundance of Common Murres and Marbled Murrelets in year 1997" the project is sponsored by the Washington Department of Fish and Wildlife (WDFW) the principal investigator and project contact is Christopher W. Thompson, Senior Research Biologist for WDFW:

Dated this 02 day of JULY, 1997.

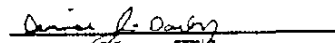
For the United States of America,
Department of Commerce/NOAA,
Department of the Interior:


Name/Title:

For the State of Washington,
Washington Department of Ecology:


Name/Title:

For the Makah Indian Tribe:


Name/Title:

980617

FROM: STATE OF WASHINGTON
DEPARTMENT OF FISH AND
WILDLIFE
600 CAPITOL WAY NORTH
OLYMPIA, WA 98501-1091
TIN # 91-1632572

INVOICE - VOUCHER

(FORM A-19)

INVOICE NO. 47798-PT4198-4531

INVOICE DATE: 98/11/20

CONTRACT NO: RES. NO.: 1997-06

TO: Denise Baker, Chair
Tenyo Maru Trustee Committee
c/o United States Department of the Interior
U.S. Fish & Wildlife Service
510 Desmond Drive SE Suite 102
Lacey, WA 98503-1273

DEC 16 1998

LACEY, WA
RECEIVED

CONTACT PERSON: FRANK GESSWEIN

CONTACT PHONE NO. (360) 664-4992

CONTRACT TITLE: TENYO MARU SEABIRD PROJECT FY 98 (At-Sea Distribution and Abundance of Common Murres
and Marbled Murrelets.)

CONTRACT TERM: 07/02/97 - 07/31/98

BILLING PERIOD: 07/02/97 - 05/31/98

CONTRACT AMOUNT: \$59,131.00

BILLINGS TO DATE: \$59,131.00

CONTRACT BALANCE: \$0.00

PAST DUE AMOUNT: \$0.00

CURRENT MONTH BILLING AMOUNT: \$59,131.00

BILLING AMOUNT: \$59,131.00

ACCURED IN FISCAL YEAR 1998
BUT NEVER SENT OUT INVOICE
TILL MONDAY NOVEMBER 23, 1998.
GENERATED PER DAVID MUDD'S
PHONE CALL WITH DENISE BAKER
FRIDAY 11/20/98!

(IF ALREADY PAID PLEASE DISREGARD)

TOTAL OVERHEAD 9,441.08

ACCOUNT CODE

FOR DEPARTMENT OF FISH AND WILDLIFE USE ONLY

TRANS CODE	FUND	GL	PROJ	SUB PROJ	MAJOR GROUP	MAJO SRC	SUB SOURCE	PAYMENT AMOUNT
	001	1352	4531		04	41	PT4198	49,689.92
	001	1352	4531		04	40	IN4198	9,391.39
	001	1352	4531		04	40	404198	49.69

***** SINCE NOT PAID BY: JUNE 30, 1998 RECORDED AS AN ACCRUAL TO: GL 1312 *****

Vendors Certificate. I hereby certify under penalty of perjury that the items & totals listed
herein are proper charges for materials, merchandise or services furnished to the State of
Washington, & that all goods furnished and/or services rendered have been provided without
discrimination on the grounds of race, creed, color, national origin, sex or age.

TOTAL 59,131.00

Prepared by: DATE: Approved by: DATE:
7/20/98 D. Baker 11/20/98
Recorded by: Date:

DISTRIBUTION ORIGINAL COPY - BILLING AGENCY PINK COPY - CONTRACT FILE
rev. 6/29/93 YELLOW COPY - RETURN WITH PAYMENT GOLDENROD COPY - ACCOUNTS RECEIVABLE FILE